

100576110
AP20 Rec'd PCT/PTO 11 MAR 2006**Profile and method for producing a profile**

The invention relates to a profile for frames of wall elements, doors or windows and to a method for producing the profile having the features of the preamble to the independent claims.

Profiles of this type are meant, in particular, also to serve to ensure a thermal insulation for the frame structure. A further possibility of use consists in fire protection.

EP 0 802 300 A2 shows, for example, a composite profile having two metal profiles and metal strips which connect the same, whereby three inner chambers are formed. The metal strips possess punch-outs, which form webs, for reducing the heat flow through the composite profile. EP 0 802 300 A2 further shows that the metal strips are positively connected to metal profiles having guide grooves. Such a composite profile, as a result of the relatively complicated construction and, in particular, as a result of the nature of the connection of the center part to the two metal profiles, is relatively difficult to produce and expensive.

DE 195 26 795 describes a composite profile comprising two mutually spaced metal profiles and an intervening insulating material, the two profiles, respectively outwardly directed, approximately U-shaped profiles, being mutually connected by the welding of metal webs to the respective side faces of the profiles. A metal web can here also be configured as a side wall having plurality of openings. The metal webs or side walls must, however, have an excess length, that is to say the height of the metal webs must be greater than the distance between the two profiles. This side wall can be attached only laterally to the profiles can only laterally to the profiles, so that at least a part of the side wall protrudes. The handling and use of such a profile can be difficult. The external situation of the side walls likewise creates difficulties for a lining of the side walls. From visual aspects also, a composite profile of this

kind is poorly suited for use in frames of wall elements, doors or windows.

One object of the present invention is therefore to avoid the drawbacks of the prior art, in particular to provide a device and a method of the type stated in the introduction, which device can be constructed, in particular, in a simple manner and the production of which requires as few work steps as possible. The profile is intended on the one hand, to ensure as low a thermal conduction and as good a thermal insulation as possible and, on the other hand, to exhibit a high static and dynamic stability. The profile is intended for use as a basic profile for profiles and composite profiles for frames of wall elements, windows or doors of various fields of application.

According to the invention, this object are achieved with a profile according to the features of the characterizing part of the independent claims.

The profile essentially comprises three components: top part, bottom part and side walls which connect the same. The top and bottom side respectively contain an end wall. These components consist of metal materials, preferably of steel, having relatively high thermal conduction. In order to reduce the thermal conduction through the profile, from the top part to the bottom part, the side walls are provided with obliquely running webs. As a result of the oblique arrangement of the webs, the webs are configured long in relation to the distance apart of the top part and bottom part.

Consequently, the heat transfer through the side walls due to thermal conduction across the webs is reduced, and the thermal insulation of the frame improved. The greater the obliqueness and the longer the configuration of the webs, the higher will basically be the thermal insulation. The side walls are welded to the top part and/or to the bottom part. The height of the side walls is here less than or equal to the distance between the end walls of the top part and bottom part. A profile having

good thermal insulation and good static properties can thus be produced in a cheap and simple manner. Such a profile is likewise distinguished by the fact that it can be used for fire protection or, indeed, break-in protection.

Particularly advantageously, the top part and/or the bottom part have at least one angular deviation, running parallel to a side wall, for the formation of a contact surface with a side wall. In the region of the contact surface, the top part and/or the bottom part is then welded to the side walls. Such an arrangement makes the welding substantially easier. Since the angular deviation lies parallel to a side wall and rests flat against a side wall, the side walls can be easily connected to the top part and bottom part by laser welding methods. The production costs for a profile can be substantially reduced. This embodiment is particularly well suited to a rational, automatic mass production of a profile.

Preferably, the side walls are disposed on the inner side. The top part, the bottom part and the side walls which connect the same form a chamber. On the inner side means, in this context, that the side walls are disposed on the side facing toward the chamber. This has primarily the advantage that the profile has no protruding parts in relation to the side wall. Since at least a part of the side wall is "concealed", such a profile meets exacting esthetic requirements. Moreover, a side element, for example a plastics strip or a fire protection strip, can be more easily fastened to the side wall, since the side wall is disposed inside the profile, for example side elements can be fastened to the side walls flush with the angular deviations.

It is advantageous if the side walls possess parallel-running guide grooves. A guide groove can here serve as a stop for a second or adjacent profile. Two mutually parallel-running guide grooves can also be used, however, to receive side elements, for example a plastics strip or fire protection strips.

The invention can be realized in a particularly simple manner if at least one side wall possess respectively laterally disposed, preferably U-shaped mountings for the reception of a side element. A mounting of this type can be easily produced, for instance, by angling off the side wall on both sides such that a U-shaped mounting is respectively formed in the sides facing toward the top part and toward the bottom part of the profile. A receiving fixture for a side element can thereby be produced in a cheap and simple manner. A web can have a bead running in the longitudinal direction of the web. In general, the bead is formed in the shape of an inwardly directed indentation. It is here advantageous that the profile meets exacting static requirements.

The webs can advantageously be configured as one or more rows of approximately V-shaped arrangements. A row of approximately V-shaped web arrangements is achieved, for example, by the fact that openings in the form of alternately mutually staggered triangles or trapeziums are made in the side walls. A plurality of rows of approximately V-shaped web arrangements form a crosswise or X-shaped arrangement. The webs do not, however, necessarily have to be formed just by the making of openings in the side walls. Thus, it is absolutely possible to weld the webs individually to the top part and to the bottom part respectively. The essentially approximately V-shaped arrangement of the webs has the advantage that the profile has good thermal insulation and good static properties. An additional advantage is that a considerable weight saving is possible.

To the side walls, linings are able to be attached. Such a lining has the advantage that the side wall can be covered in a cheap and simple manner. Linings may also have different colors.

If the top part and the bottom part have angular deviations, it is advantageous if on the angular deviations, at their end region, there are disposed inwardly directed end faces. In this case, the side walls of the profile are welded to the top part and the bottom part in the region of the end faces. The end

faces are preferably provided with a stop for a side wall, which stop defines the end of a top part and bottom part respectively. The advantageously rectangular or approximately rectangular angular deviations are generally applied on both sides and run parallel to the side walls. It is important that, as a result of the inwardly directed end faces, a depression is created on the profile, into which elements such as fire protection strips or cover strips can advantageously be fitted. The profile thus generally has no laterally projecting parts. The stops of the end faces of a top part and of a bottom part, which stops lie respectively opposite one another and preferentially run parallel to the angular deviations, form bearing surfaces for a respective side wall. In the chamber of the profile, furthermore, respectively the top part and/or in the bottom part, in the region defined by the end faces, heat-insulating plates, or, in particular, also fire protection plates, could be easily received.

The angle between an end face and an angular deviation of a top part or bottom part lies between 5° and 170° , preferentially between 5° and 135° , especially preferentially between 20° and 90° . As a result of the preferred embodiment and especially as a result of the particularly preferred embodiment of 90° or thereabout, an advantageous depression for the reception of side parts such as cover strips or fire protection strips is created.

Particularly advantageously, an inwardly directed end face and a stop form a groove for the reception of side elements. If the top and bottom parts are made of plate, the groove, for example, can be made particularly simply by edging processes. The groove forms an approximately U-shaped mounting for the side elements, the width and depth of the groove being dependent on the respective purpose of use of the profile. Insofar as metal plates are used for the top and bottom part, then these can be produced in a simple manner by an edging or roll-forming method.

Particularly advantageously, the side walls are welded to the end faces of the angular deviations. A welding can thus be realized relatively simply from outside.

Alternatively, the side walls can be welded to the preferably short parallel stops of the end faces. The stops form bearing surfaces for the placement of the side walls. As a result of the welding in the region of the planar bearing surface, the welding remains relatively warp-free. Particularly advantageously, the weld seams are configured as stitch seams.

It is advantageous if the top part and bottom part consist of steel and the side walls of high-grade steel. As a result of the different steel types, the profile has particularly good heat-insulating properties, since high-grade steel conducts heat less well than ordinary steel. The profile can in this case still be produced relatively cheaply.

A web of a side wall can have a bead running in the longitudinal direction of the web. The bead is configured as a preferably inwardly directed indentation of approximately semicircular cross section. A profile having a bead arrangement exhibits improved static properties.

A further aspect of the invention relates to a profile for frames of wall elements, doors or windows, having a top part and a bottom part and side walls which connect the same and have openings. On the side walls, in the region of the openings, there are provided inwardly deformable cams for the fixing of insulation material. According to the purpose of use, one or more cams can be provided per opening. The shape of the cams can be chosen as desired, though they should be inwardly deformable in a relatively simple manner. With the aid of the cams, a profile whose chamber contains insulation material is distinguished by an advantageous fixing of the insulation material. Especially in relation to the longitudinal direction of the profile, the insulation material is seated firmly in the chamber and slippage is rendered impossible. As a result of the cams, insulation material which only partially fills the chamber of the profile and is disposed, in particular, centrally in the region of the side walls can also be fixed simply.

Advantageously, the insulation material is held by the cams in a non-positive and/or positive manner in the chamber of the profile. For example, the insulation material, as a result of plastic deformation of the insulation material, can engage in the latter. It is also conceivable, however, that the insulation material has preformed corresponding cutouts for the reception of the inwardly deformable cams. It is also conceivable that the cams additionally have inwardly directed claw-like elevations.

Preferably, a cam is disposed approximately centrally in the region of the base of an opening. The base here forms that part of the opening which runs in the longitudinal direction of the profile. Advantageous in this cam arrangement is that the cams are situated at a statically favorable location and the cams can be pressed in a rational and simple manner.

Insulation material can be disposed in the region of the side walls, whereby an upper and lower chamber is formed. The insulation element is preferably approximately rectangular in cross section. According to the purpose of use, these two chambers can likewise be filled with insulation material, fire protection elements or similar. The approximately central arrangement of the insulation material leads to particularly good heat-insulating properties of the profile.

A further aspect of the invention relates to a method for producing a profile for frames of wall elements, doors or windows, having a top part, a bottom part and side walls which connect the same, the side walls having webs for improving the heat-insulating properties of the profile and cams for the fixing of insulation material. For the fixing of the insulation material, which is disposed in the chamber of the profile, the cams are pressed in inward. This can be realized by a milling, rolling and/or pressing method. The inwardly deformable cams are provided in the region of the side wall openings formed by the webs. The described method for the fixing of insulation material can also be applied in profiles which have no webs or openings.

Preferably, the cams are pressed into the insulation material or are pressed in inward in such a way that, through plastic deformation of the insulation material, they engage positively in the insulation material. Naturally it is conceivable that - in place of insulation material - other materials or elements, for example fire protection elements, are fixed in a profile according to this method.

A further aspect of the invention relates to a method for producing a profile for frames of wall elements, doors or windows, having a top part, a bottom part and side walls which connect the same, the side walls having webs. With the aid of a punching or cutting method, especially a laser cutting method, openings are made in the side walls. If the profile is meant to have cams, these are preferably punched or cut out of the side walls in the same work step. Subsequently, the side walls are welded to the top part and the bottom part.

Advantageously, the top and bottom parts are made of a plate. By an edging and/or roll-forming method, the plates can be easily deformed in such a way that preferably on both sides there are formed approximately rectangular angular deviations and, disposed thereon, inwardly directed end faces with a stop.

Further individual features and advantages of the invention emerge from the following description of the illustrative embodiments and from the drawings, in which:

- figure 1 shows a perspective representation of a profile according to the invention,
- figure 2a shows a cross section through a profile,
- figure 2b shows a plan view of a side wall, which is integrally connected to a bottom part, before being shaped into an L-profile for use for the profile according to figure 2a,

- figure 3 shows a cross section through a further illustrative embodiment of a profile,
- figure 4 shows a cross section through a further illustrative embodiment of a profile,
- figure 5 shows a cross section through a fifth illustrative embodiment of a profile,
- figure 6 shows a cross section through a sixth illustrative embodiment of a profile,
- figure 7 shows a cross section through a profile according to a seventh illustrative embodiment,
- figure 8a shows a view of a side wall for a profile,
- figure 8b shows a view of a side wall for a further profile, and
- figure 9 shows a cross section through a profile according to a further illustrative embodiment,
- figure 10 shows a part-detail from a cross section through an alternative profile,
- figure 11 shows a part-detail from a cross section through a further profile,
- figure 12 shows a cross section through a profile according to a further illustrative embodiment,
- figure 13 shows a part-detail from a cross section through a further profile,
- figure 14 shows a part-detail from a cross section through a further profile,

figure 15 shows a cross section through a profile according to the illustrative embodiment of figure 13,

figure 16 shows a plan view of a side wall with cams,

figure 17 shows a detailed view of a cross section through a profile with cam pressed in inward.

As represented in figure 1, a profile denoted in its entirety by 1 essentially comprises three components: a top part 16, a bottom part 2 and the side elements 5. The components here consist of metal materials, for example steel, special steel or aluminum. Figure 1 shows a profile of rectangular cross section. The respective components are configured as flat profiles. Naturally, the cross-sectional shape and geometry of a profile 1 can be made more complicated. The individual components, that is to say the top part 16, the bottom part 2 and the side walls 5, do not necessarily have to be of flat configuration, but can be made, for example, even U-shaped or T-shaped. As can be seen from fig. 1, the profile is elongated in shape. The side walls 5 and the top part 16 and the bottom part 2 are respectively disposed parallel to each other. The side walls 5 represented in figure 1 serve as spacers for the distancing of the parallel-running top part 16 and bottom part 2. The chamber 13 formed by the top part 16, the bottom part 2 and by the side walls can serve to receive insulating and fire protection material.

The side walls 5 are respectively connected by welding to the top part 16 and to the bottom part 2. The weld seam 15 here runs in the longitudinal direction. Instead of an unbroken seam, broken seams (stitch seams) are also conceivable.

Figure 2 shows a profile in which the top part 16 is integrally connected to the side wall 3, and the bottom part 2 to the side wall 4, and respectively have an L-shape in cross section. These two L-profiles are joined together and welded together, whereby a rectangular profile is formed. Figure 2b shows a plan view of a planar profile comprising the bottom part 2 and the side wall

4, which is provided for use in the profile 1 according to figure 2a. This profile is here shaped, milled or edged, with respect to the edging line 14, into an L-profile according to figure 2a.

The weld seam 15 is disposed in the region of the corners of the profile 1. For profiles 1 which are exposed to higher static loads, a V-seam or I-seam, for example, should be provided. For this, the top part 16 or the bottom part 2 would need to possess, for example, an additional angular deviation, whereby the top part 16 and the bottom part 2 would be flush in the region of the provided seam.

Figure 2b further shows the obliquely running webs 5, which are created by the making of openings 11 in the side wall 4. The webs 5 are here inclined at an angle of 45° in relation to the longitudinal axis of the profile. Naturally, other angles of inclination are conceivable, for example angles of inclination between preferably 30° to 90° . Naturally, the webs 5 could also be disposed perpendicular to the longitudinal axis. The webs 5 and the openings 11 are generally disposed centrally in a side wall 4. The web spacing a can in this case vary according to the required thermal insulation or static requirement for a profile of frames for doors, windows or wall elements. The length of the webs 5 is dependent on the web spacing a and on the angle of inclination of the webs. A web 5 which is obliquely configured in this way, by virtue of its length in relation to the web spacing a , reduces the heat passage due to heat conduction. If, for example, the heat conduction is meant to be small, then, in particular, the web spacing a (in relation to the distance between the top part 16 and the bottom part 2) is chosen, whereas if the profile 1 is meant to withstand high static and possible dynamic loads, then a smaller web spacing is chosen. As is shown in figure 2b, the openings 11 are in the form of a trapezium. The openings 11 are cut out, for example, by a laser-cutting method.

Figure 3 shows an approximately U-shaped profile comprising the two side walls 3 and 4 and the bottom part 2. The top part 16 is

welded to the U-profile to the side walls 3 and 4. The weld seam 15 is here configured as a fillet weld.

Figure 4 shows an alternative profile to figure 3. Here, in contrast to figure 3, the top part 16 is angled-off, whereby the top part, too, 16 is configured in a U-shape. The top part 16 can thereby be connected to the side walls 3 and 4 by a roller seam or a series-welded seam.

Figure 5 shows a further profile 1. The top part 16 and the bottom part 2 in this case respectively protrude in relation to the side walls 3 and 4, so that the weld seam 15 are respectively fillet welds. The side walls 3 and 4 serve as spacers (evidently the height h is equal to the distance A between the top part 16 and the bottom part 2) for the top part 16 and the bottom part 2. They respectively possess two parallel-running guide grooves 10, between which a side element 9 is disposed. The guide grooves 10 serve, in particular, also to clamp the side elements 9 against the side walls 3 and/or 4. Such a side element 9 can comprises, for example, a fire protection element, for example a fire protection strip, a plastics cover strip for covering the webs 5 and the openings 11, or a medium seal. According to the individual purpose, variously thick top parts 16 or bottom parts 2, for example, can be used, which, inter alia, opens up a large number of fields of application for the profile 1.

Further illustrative embodiments of the profiles according to the invention are shown in figures 6 and 7. These figures show side walls 3 and 4, the height h of which is less than the distance A between the top part 16 and the bottom part 2.

The top part 16 and the bottom part 2 respectively possess angular deviations 6, which run parallel to the side walls 3 and 4 and against which the side walls 3 and 4 respectively bear flatly. Preferably, the side walls 3 and 4 are fitted on the inner side, as shown by figures 6 and 7. As a result of the bearing contact, a contact surface 7 is formed, allowing the side walls 3, 4 to be easily welded to the top part 16 and bottom

part 2 respectively. The welding can be realized, for example, by a laser-welding method. Naturally, it is also conceivable for the side walls 3 and 4 to be fitted on the outer side. The inner-sided fitting of the side walls 3 and 4, however, makes it possible, for example, to fit side elements 9 to the side walls 3 or 5, between the top part 16 and the bottom part 2, in such a way that they are arranged approximately flush in relation to the top and bottom parts 16 and 2. Naturally, the thickness may vary according to the purpose of use of a side element 9. Possible side elements are, for example, fire protection strips, seals or fittings for windows or doors. As is represented in figure 6, a side wall can also have a further lining 12 fitted to it. The fitting is here realized, for example, by gluing. The bottom part 2 additionally possesses a lateral part 17, for example in the form of a tab, in particular a compressed nose, which is formed, for example, by bending and/or folding of a plate. This lateral part 17 can be used, for the assembly of a frame for doors or windows, as a stop element in relation to adjacent profiles, for example a window casement, (not shown in the drawing).

As can be seen from figure 7, the side walls 3 and 4 possess mountings 8. These are of U-shaped configuration and serve, in particular, to receive the side element 9. Starting from a plate, said side element is shaped, for example, with the aid of a bending method such that, on both sides of the plate, a U-shaped mounting 8 is formed. Preferably, the side element 9 is here disposed, prior to the bending, on the plate, whereby, after the bending, the plate is positively fastened in the U-shaped mountings 8. The side walls 3 and 4 which are thus formed are then welded in the region of the angular deviation 6 of the top part 16 and of the bottom part 2. The side element 9 according to figure 7 is possesses centrally a T-shaped cam 18. The cam 18 serves, in particular, for the positive reception of fittings or medium seals.

Figures 8a and 8b show variants of arrangements of webs 5, 5'. Thus figure 8a shows, for example, that the webs 5 and 5' are

arranged in a plurality of rows in a V-shape. Consequently the webs 5 and 5' cross, whereby an X-like web pattern is formed. Evidently, the openings 11' and 11'' are shaped as triangles and rhombuses. In figure 8b, a hexagonal opening 11''' is further shown.

Figure 9 shows a profile 1 in which the side walls 3 and 4 are arranged such that they are offset inward. The depression which is thus formed is particularly well suited to the reception of side parts such as, for example, cover strips, fire protection strips or medium seals. For this, respectively extending from the angular deviations 6 of the top and bottom parts 16 and 2 are inwardly directed end faces, roughly in the shape of offsets. An end face 22 has as termination a stop 23, which runs parallel to the angular deviation 6 and thus also parallel to the side walls 3 or 4. The stops 23 of the end faces 22 form bearing surfaces for the side walls 3 and 4. As can be seen from figure 9, the oblique end faces 22 are angled off in such a way that the angle α between the end face 22 and the angular deviation 6 measures about 60° . For the angle α , a range of $20 - 80^\circ$ is preferred. According to the purpose of use, other embodiments of the end face 22 are also conceivable. The angle α is, however, greater than 5° and less than about 170° . In figure 10, the end faces 22 protrude at a right angle ($\alpha = 90^\circ$) from the angular deviations. The stop 23 is shaped relatively short. The side walls 3 and 4 are welded in the region of the end face 22 to the top part 16 and bottom part 2. In the present illustrative embodiment, the side walls 3 and 4 are welded with the aid of a fillet weld 15 directly to the oblique end face portions 22. Instead of as in figure 9, in which inwardly directed end faces 22 are disposed on both sides, the profile 1 can also have end faces 22 and depressions on just one side. The other, opposite side could be shaped, for example, as shown in figures 6 and 7.

Figure 11 shows a variant of a profile 1 having end faces 22. The side wall 3 is angularly offset or deep-drawn, whereby a further depression is formed. As can be seen from figure 11 (and

also from figures 9 or 10), the side walls are disposed on the outer side. Naturally, an inner-sided arrangement of the side walls is also conceivable. The side walls could, for example, be weld-connected to the portions 23 by roller seams or series-welded seams 15. It might also be conceivable (not represented in a figure) for the side walls 3 and 4 to be shaped in such a way that the side walls are welded by butt joint respectively to the ends of the parallel portions 23 of the offset 21.

A profile 1 in fire protection version is shown in figure 12. By the end faces 22, regions are defined in which fire protection elements 24 can be easily inserted. Naturally, the chamber 13 of the profile 1 could also be fully filled with fire protection materials. The fire protection elements 24 or fire protection materials consist, for example, of energy-consuming materials, such as alum, glass wool or gypsum. For profiles 1 intended solely for heat insulation, said fire protection elements could be replaced by corresponding heat-insulation materials. In the depressions formed by the end faces 22, side elements 9 are disposed. The side elements 9 could be shaped as fire protection strips from material which inflates under the effect of heat. A side element 9 rests flat against the side walls 3 or 4 and is preferentially fastened by gluing. Other types of fastening, for example with the aid of screws, are conceivable. As a result of the particular shaping of the offsets 21, it is further also conceivable (particularly given a preferred angle α of between 20° and 90°) that side elements 9 are connected to the profile 1 by clamping or latching means.

Figures 13 and 14 show a profile 1 in which the inwardly directed end faces 22 and the stop 23 form a groove 25 which receives the side wall. As a result of the groove 25, a space can also be created in which side elements, for example cover elements for the side walls or fire protection strips, can be easily disposed. Insofar as metal plates are used for the top and bottom parts, the approximately U-shaped grooves 25 of the side walls 3 and 4 can be easily produced by an edging or roll-forming method. For the production of the profile 1, the pre-

formed top and bottom parts 16 and 2 are distanced apart in a predefined position. The side walls 3 and 4 are introduced laterally through the upper and lower groove 25 and then welded in place. It is further apparent in figures 13 and 14 that a web 5 of the side wall 3 has an inwardly directed bead 26.

In figure 13, the angular deviations 6 of the top and bottom parts 16 and 2 are approximately equal in height, the side wall 3 being disposed approximately centrally in relation to the profile 1. In figure 14, the side wall 3 is disposed on one side. In comparison to the profile according to figure 13, in the profile 1 according to figure 14 the side wall 3 is extended and the angular deviation 6' of the lower profile is correspondingly shortened. As a result, the webs are lengthened and the profile 1 boasts a higher heat-insulating capacity. Naturally, the top part 16 or both parts could also be shortened correspondingly.

Figure 15 shows a profile 1 in which an insulation element 28 of rectangular cross section is installed centrally in the region of the side walls 3 and 4. The insulation material 28 is preferably fixed by cams (for this, see figures 16 and 17 below). As a result of the central arrangement of the insulation material 28, an upper and a lower chamber 30 and 31 is formed. It is absolutely conceivable that, in the cavities of the chambers 30 and/or 31, insulation or fire protection material can be disposed. Cables, too, could be run through these chambers.

Figure 16 shows a side view of a side wall (3 or 4), the obliquely running webs 5 are arranged in a V-shape, whereby approximately triangular openings 11 are formed. The webs 5 additionally possess a bead, which runs in the longitudinal direction of the web. The beads 26 are made preferably by a stamping, rolling or other method. Approximately centrally in relation to an opening 11, a cam 27 is disposed on the base 29. The cam 27 is integrally connected to the side wall and is preferably produced by a punching or laser-cutting method. Thus, even relatively complicated cam shapes are able to be produced. Evidently, the cam 27 has a taper 34 in the direction of the base

29, whereby the cam 27 can be deformed inward more easily and with less effort. Naturally, other shapes, too, are conceivable, for example the cam 27 can be of rectangular, triangular or trapezoidal configuration. Figure 17 shows a cam 27 in the pressed-in or deformed state. Evidently, the cam 27 here engages in the insulation material 28 (the press-in direction is indicated with an arrow). This ensures that the insulation material, particularly in the axial or in the longitudinal direction of the profile 1, has a firm fit.